

CLAIMS

1. A flexible semi-conductive material characterised by finely divided carbon particles uniformly dispersed in an elastomeric polymer there being carbon particle levels of 20% by weight to 75% by dry weight to 80% to 25% by dry weight of elastomeric polymer levels, the material also including an anti-adsorption compound.
2. A conductive material as in Claim 1, characterised in that carbon particle levels of 20% to 40% by dry weight to 80% to 60% by dry weight of elastomeric polymer levels are used.
3. A flexible conductive material as in Claim 1 or Claim 2, characterised in that it is in the form of conductive film or coating and comprises a carbon filled elastomeric polymer with carbon particle levels of 43% to 73% by dry weight to 57% to 27% by dry weight elastomeric polymer levels.
4. A flexible conductive material as in Claim 3, characterised in that the carbon particle level is 60% to 65% dry weight to 40% to 35% dry weight of elastomeric polymer levels.
5. A flexible conductive material as in Claim 3 or Claim 4, characterised in that the carbon particle level is 57% by dry weight to 43% by dry weight of elastomeric polymer.
6. A flexible conductive material as in any of Claims 1 to 5, characterised in that the elastomeric polymer is an aliphatic polyurethane in solution.
7. A flexible conductive material as in any of Claims 1 to 6, wherein the anti-adsorption compound is selected from the group containing polypropylene glycols and polyethylene glycols.
8. A method of forming a compound for a flexible electrical semi-conductive heater as in Claim 1 characterised by stirring fine carbon particles into an elastomeric polymer base containing an anti-adsorption compound, to achieve carbon particles to polymer levels of 20% by dry weight to 75% by dry weight to 80% to 25% by dry weight of polymer, and subjecting

mixture to high speed stirring for a pre-determined period of time, with the maintenance of the mixture below a predetermined level of temperature, to grind the carbon particles to a predetermined final fineness.

9. A method of forming a compound for an electrically conductive heater as in Claim 8, characterised in that the predetermined temperature level is not more than 25°C.

10. A method of forming a compound for an electrically conductive heater as in Claims 8 and 9, characterised in that the viscosity of the mixture is modified by the addition of a suitable solvent.

11. A method of forming a compound for an electrically conductive heater as in Claim 10, characterised in that the solvent is dimethylformamide.

12. A method of forming a compound for an electrically conductive heater as in any of Claims 8 to 11, characterised in that the carbon black particles have particulate size of approximately 30 En nm.

13. A method of forming a compound for an electrically conductive heater as in any of Claims 8 to 12, characterised in that the adsorbants may be selected from the group containing polypropylene glycols, polyethylene glycols of a required molecular weight.

14. A method of forming a compound for an electrically conductive heater as in any of Claims 8 to 13, characterised in that a polymer solution is added to the master batch such that the ratio of polymer to carbon black is 1:0.57 on a dry basis.

15. A method of forming a compound for an electrically conductive heater as in Claim 14, characterised in that the polymer solution is aliphatic polyurethane.

16. A method of forming a compound for an electrically conductive heater as in any of Claims 8 to 14, characterised in that the finished compound is refiltered prior to use.

17. A method of forming a compound for an electrically conductive heater as in any of

~~Claims 8 to 16~~, characterised in that the first stirring of fine carbon particles in to the polymer base is a slow stirring, and the high speed stirring is limited to not more than 30 minutes.

18. A web or sheet to serve as an electrically conductive heater, is characterised by applying a quantity of finished compound as in any of ~~Claims 1 to 7~~, to a release paper by way of transfer coating, to achieve a uniform coating or film of compound between 90 and 100 grams per square meter dry weight, and subjecting the web or sheet to heat progressively rising from 110 °C to 150 °C to achieve the controlled release of solvents and provide a coating or film free of pinholes.

19. A web or sheet as in ~~Claim 18~~, characterised in that a number of coatings are applied to achieve a desired thickness of coating or film.

20. A web or sheet as in ~~Claim 18~~ or Claim 19, characterised in that the release paper is matt grade and is an unembossed silicone-coated paper.

21. A flexible fabric able to serve the purpose of an electrical conductive heater is formed by taking a release paper with a coating of finished compound as in any of Claims 1 to 7, spreading thereon a further quantity of said compound, laying the release paper on a flexible fabric carrier sheet or web, and passing the composite through a fixed gap roller to ensure controlled penetration of said compound into the fabric of the sheet or web, the sheet or web thereafter being subjected to heat progressively rising from 110 °C to 150 °C to achieve controlled release of solvents and provide a coating of film free of pinholes.

22. A flexible fabric able to serve the purpose of an electrical conductive heater, characterised in that a coating of finished compound as in any of ~~Claims 1 to 7~~ is applied directly to a fabric carrier.

23. A flexible fabric able to serve the purpose of an electrical conductive heater as in ~~Claims 21 and 22~~, characterised in that the fabric is a knitted cotton material.

24. A flexible fabric able to serve the purpose of an electrical conductive heater as in Claims 21 to 23, characterised in that the fabric is a weft knitted polyvinyl alcohol fabric.

25. An electrical connection to a coat or film incorporating carbon particles, as defined in any of Claims 1 to 24, characterised by first spraying a nickel compound to an area of the coat or film, and applying to the sprayed area a tin-copper tape coated with a silver loaded conductive adhesive.

26. An electrical connection to a coat or film incorporating carbon particles as in Claim 25, characterised in that the conductive rail is overlaid by an antifaying compound, preferably wider than the rail.

27. A web or sheet as in Claims 18 to 26, characterised by the presence of an outer insulating and water/fluid resistant layer totally encasing the web or sheet.

28. A web or sheet as in Claim 27, characterised in that the water/fluid insulating layer is a polyurethane, silicone or acrylic elastomer.

29. A method of operating an electrically conductive heater of any of Claims 1 to 28, characterised in that the connection to a source of power is by way of a transformer and a control unit to supply power as a series of pulses of predetermined time with intervening periods where power is switched off for predetermined periods of time.

30. A method as in Claim 29, characterised in that during the periods where power is switched off, the temperature of the heater is sensed by strategically located temperature sensing means, that signal the control unit to continue to supply pulses of power or to signal that a predetermined temperature has been reached and suspend the supply of power.

31. A method of providing an electrically conductive heater on a product or an installation, characterised by spraying, screen printing or directly coating the compound as defined in any of Claims 1 to 17 on to the product or installation.

32. A method of providing an electrically conductive heater for a product or an installation, characterised by the employment of an appropriate polymer material into which the carbon particles are stirred that makes the compound suitable for moulding or casting to provide preformed shapes for application to a product or installation.